

CLAIMS

What is claimed is:

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1. A distributed call signaling message routing gateway comprising:
 - (a) a first distributed gateway routing element including a first interface for sending SS7 call signaling messages to and receiving SS7 call signaling messages from a first SS7 network element and for performing SS7 routing functions for the SS7 messages received from the first SS7 network element and a second interface for sending the SS7-routed messages over a virtual bus and for setting quality of service parameters in the SS7-routed messages sent over the virtual bus; and
 - (b) at least one second distributed gateway routing element including a first interface for receiving the SS7-routed messages from the first distributed gateway routing element and a second interface for SS7-routing the received messages to a second SS7 network element via an SS7 signaling link.
 2. The distributed gateway of claim 1 wherein the first interfaces of the first and second distributed gateway routing elements include SS7 MTP layer 3 routing functions for routing SS7 messages based on SS7 point codes.
 3. The distributed gateway of claim 1 wherein the first interfaces of the first and second distributed gateway routing elements are adapted to route messages based on circuit identification codes.

4. The distributed gateway of claim 1 wherein the first interfaces are adapted to screen the SS7 call signaling messages based on one or more SS7 message parameters.

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5. The distributed gateway of claim 1 wherein the first interfaces of the distributed gateway routing elements are adapted to copy the SS7 call signaling messages and forward the copies to a predetermined network monitoring or accounting node.

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6. The distributed gateway of claim 1 wherein the distributed gateway routing elements each include a triggerless number portability process for identifying call signaling messages relating to calls to ported numbers and for overriding the SS7 routing functions for the call signaling messages related to calls directed to ported numbers.

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7. The distributed gateway routing element of claim 1 wherein the second interfaces of the first and second distributed gateway routing elements include protocol translation processes for translating the protocol of the SS7-routed messages to and from the protocol of the virtual bus.

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8. The distributed gateway of claim 1 wherein the second interfaces of the first and second distributed gateway routing elements include quality of service manager processes for setting the quality of service

parameters in the SS7-routed messages to be transmitted over the virtual bus.

9. The distributed gateway of claim 1 wherein the first and second distributed gateway routing elements are co-located with the first and second SS7 network elements.
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10. The distributed gateway of claim 9 wherein the first and second distributed gateway routing elements are co-located with service switching points (SSPs).
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11. The distributed gateway of claim 9 wherein the first and second distributed gateway routing elements are co-located with service control points (SCPs).
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12. The distributed gateway of claim 9 wherein the first distributed gateway routing element is co-located with a service switching point and the second distributed gateway routing element is co-located with a service control point (SCP).
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13. The distributed gateway of claim 9 wherein at least one of the first and second distributed gateway routing elements is co-located with a signal transfer point (STP).
- Subs A4

- Subs 9-14*
- 14. The distributed gateway of claim 9 wherein at least one of the first and second distributed gateway routing elements are co-located with a softswitch.
 - 5 15. The distributed gateway of claim 9 wherein at least one of the distributed gateway routing elements is co-located with an application server.
 - 10 16. The distributed gateway of claim 1 wherein at least one of the first and second distributed gateway routing elements are co-located with more than one SS7 network element.
 - 15 17. The distributed gateway of claim 1 comprising a translation services module coupled to the first and second distributed gateway routing elements via the virtual bus for translating SS7-routed messages.
 - 20 18. The distributed gateway of claim 17 wherein the translation services module is adapted to perform global title translation services for the SS7-routed messages.
 - 19. The distributed gateway of claim 17 wherein the translation services module is adapted to perform directory number to Internet protocol address mapping for the SS7-routed messages.

20. The distributed gateway of claim 17 wherein the translation services module is adapted to perform number portability translation services for the SS7-routed messages.
- 5 21. The distributed gateway routing element of claim 17 wherein the distributed gateway routing elements and the translation services module share a single SS7 point code and function collectively as a signal transfer point.
- 10 22. The distributed gateway of claim 1 wherein the first and second distributed gateway routing elements each comprise a general purpose computer.
- 15 23. The distributed gateway of claim 1 comprising an operations, administration, and maintenance element coupled to the first and second distributed gateway routing elements for provisioning and maintaining databases on the first and second distributed gateway routing elements.
- 20 24. The distributed gateway of claim 23 wherein the operations, administration, and maintenance element is coupled to the first and second distributed gateway routing elements via a simple network management protocol (SNMP) interface.

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25. A distributed gateway comprising:
- (a) a first distributed gateway routing element co-located with an SS7 service switching point for receiving call signaling messages from the service switching point via an SS7 signaling link, for determining quality of service parameters for the call signaling messages, for generating and adding a header to each of the call signaling messages, the header including the quality of service parameters, and for forwarding the call signaling messages over a virtual bus; and
- (b) a second distributed gateway routing element co-located with a second service switching point for receiving the call signaling messages from the virtual bus, removing the headers, and for forwarding the call signaling messages to the second service switching point via an SS7 signaling link.

26. The distributed gateway of claim 25 comprising a third distributed gateway routing element coupled to the first and second distributed gateway routing elements via the virtual bus, the third distributed gateway routing element being co-located with an SS7 service control point for sending and receiving call signaling messages via the virtual bus with a specified quality of service.
27. The distributed gateway of claim 25 comprising a translation services module coupled to the first and second distributed gateway routing

elements via the virtual bus for performing SS7 translation operations on received call signaling messages and for forwarding the translated call signaling messages to one of the first and second distributed gateway routing elements via the virtual bus.

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28. The distributed gateway of claim 27 wherein the translation services module is adapted to convert the call signaling messages between American National Standards Institute (ANSI) to International Telecommunications Union (ITU) message formats.

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29. The distributed gateway of claim 25 comprising an operations, administration, and maintenance module coupled to the first and second distributed gateway routing elements via the virtual bus for provisioning and maintaining databases associated with the first and second distributed gateway routing elements.

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30. A method for routing SS7 messages using a distributed gateway, the method comprising:
- (a) receiving an SS7 call signaling message from an SS7 network element via an SS7 signaling link;
 - (b) performing SS7 routing operations on the SS7 call signaling message;
 - (c) determining quality of service parameters for the SS7 call signaling message;
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- (d) adding a virtual bus header to the SS7 call signaling message and setting the quality of service parameters in the virtual bus header; and
- (e) sending the call signaling message to a distributed gateway routing element associated with a destination SS7 network element via the virtual bus.

5 31. The method of claim 30 wherein setting quality of service parameters in the virtual bus header includes setting a parameter in a flow label field
10 of an Internet protocol version 6 header.

15 32. The method of claim 30 wherein setting quality of service parameters in the virtual bus header includes writing a predetermined value into a type of service (TOS) field in an IP version 4 header.

33. The method of claim 30 wherein setting quality of service parameters in the virtual bus header includes adding a multiprotocol label switching (MPLS) header to the call signaling message.

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